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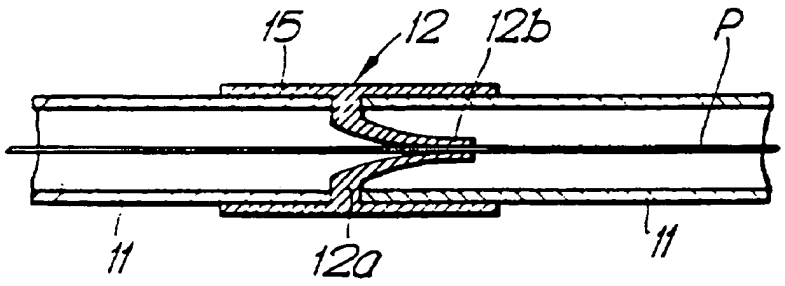
(54) Gas seal

(57) A gas seal arrangement for use in a blown-fiber duct (11) which extends outside a building from within a building, the gas seal arrangement being inserted in a segment of said duct to prevent the flow of gas into the building via said duct (11) and being unidirectionally flexible, the arrangement comprising a connector (15) sealingly connected to respective blown-fiber duct portions on each side thereof, along which the transmission fiber (P) is disposed, the connector further comprising a flange portion (12a) and a flexible body portion (12b), the flexible body portion being arranged to collapse inwardly around a transmission fiber (P) when the transmission fiber has been installed through said duct segment , the flexible body portion being arranged to open to permit gas flow outwardly from the building through said duct segment when the gas flow pressure exceeds a predetermined level, i.e. during the time when the fiber is blown into the duct, and wherein the flexible body portion extends along said duct segment when at rest and is arranged to form an elongate seal with the surface of an installed transmission fiber (P) resistant to opening to gas flowing inwardly.

Fig.2.



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Description

This invention relates to a sealing arrangement for a duct, and in particular to a seal for incorporation in a duct along which an optical fibre package is installed by fiber blowing. The present application is a divisional application of the parent application EP-A-0 363 188.

A duct along which a transmission line (e.g. optical fibre) package is installed provides a continuous path along which fluid can travel. Unless such a duct is provided with seals to inhibit fluid flow, hazards can arise. For example, gas leaks may result in the introduction of toxic or explosive gases at secondary locations, or water may leak across watertight bulkheads. Therefore, to comply with safety requirements, after a blown optical fibre installation is completed, seals or blockages are provided at intervals by perforating the duct and injecting a resin. The disadvantage of this technique is that the resin forms a permanent blockage in the duct, and prevents further installation of fiber packages, or the replacement of an installed package without first removing the resined section of the duct. Removal of the resined section is time-consuming, and requires cutting of the optical fibre package, requiring subsequent replacement of a complete duct section, or the introduction of additional splices.

The aim of the invention is to provide a seal that does not prevent subsequent installation operations.

The present invention provides a gas seal arrangement for use in a blown-fiber duct which extends outside a building from within a building, the gas seal arrangement being inserted in a segment of said duct to prevent the flow of gas into the building via said duct and being unidirectionally flexible, the arrangement comprising a connector sealingly connected to respective blown-fiber duct portions on each side thereof, along which the transmission fiber is disposed, the connector further comprising a flange portion and a flexible body portion, the flexible body portion being arranged to collapse inwardly around a transmission fiber when the transmission line has been installed through said duct segment, the flexible body portion being arranged to open to permit gas flow outwardly from the building through said duct segment when the gas flow pressure exceeds a predetermined level, i.e. during the time when the fiber is blown into the duct, and wherein the flexible body portion extends along said duct segment when at rest and is arranged to form an elongate seal with the surface of an installed transmission fiber resistant to opening to gas flowing inwardly.

The invention further provides a blown-fiber installation comprising a duct within which is received an optical fiber which has been installed within said duct by means of a fiber blowing process, characterised in that the installation further comprises at least one sealing arrangement of the present invention, the sealing arrangement providing a gas-seal to said optical fiber and being inserted in a segment of said duct.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic section through a duct showing an embodiment of seal according to the invention in an open condition; and

Figure 2 is a schematic section through a duct showing the seal of Figure 1 in a sealing condition.

The type of system with which the invention is concerned, and the context in which it is described, is in blown fiber installations. Fibre blowing is the process described in our European patent application EP-A-0 108 590, in which lightweight transmission lines are urged along ducts by the viscous drag of a fluid, usually compressed air. The propellant air is typically at an initial pressure of 3 to 10 bar. The transmission lines typically comprise a bundle of optical fibres encased in a lightweight outer covering, and this is termed a fibre package. Fibre packages may also consist of single fibres or lines, and may include electrical conductors

Referring to the drawings, Figures 1 and 2 show an embodiment, in which a duct 11 is provided with an insert seal 12 which comprises an annular flange portion 12a and a body portion 12b. The flange portion 12a engages between two connecting sections of the duct 11, and is formed as part of the connector 15 that holds the duct section together. Alternatively, the flange portion 12a of the seal 12 is adapted to be held by the connector 15. The body portion 12b is made of a relatively-soft, flexible material such as synthetic rubber, and may have a variety of configurations. For example, it may be tubular with a bore diameter substantially equal to, or less than, the minimum diameter of the transmission line package P that is to be installed along the duct 11.

The bore of the tubular body portion 12b may be conical or tapering, with the wider end connected to the flange portion 12a. Alternatively, the tubular body portion 12b may comprise a flat body portion consisting essentially of upper and lower lip portions that press against each other in the undisturbed state.

When at rest, either before or after installation of the transmission line package P along the duct 11 the body portion 12b is collapsed inwardly as shown in Figure 2. When the transmission line package P is present the tubular body portion 12b forms a seal around the package P which is sufficiently close-fitting to prevent substantive egress (or low pressure flow) of gas along the duct 11. The elasticity of the seal 12 is such that, from one direction, a relatively high pressure flow of gas, such as 7kg/cm^2 (100 psi) will expend the seal sufficiently to enable passage of the package P (see Figure 1). Preferably, the seal 12 expands to lie substantially flat against the sides of the duct 11, thereby presenting a minimum impedance to the passage of the package P during a blowing installation. Once the package P is installed, and the injection of compressed gas into the duct 11 has

ceased, the body portion 12b of the seal 12 collapses back onto the fibre package.

The seal described above with reference to Figs. 1 and 2 is unidirectional, in that it permits fibre blowing installation in one direction, but would remain resistant to opening in the opposite direction. By providing a sufficiently-thin seal, rather like a diaphragm with a central, short-lipped aperture, a seal that will open bidirectionally can be provided, with the lips inverting through the aperture to permit either direction of high pressure flow.

Unidirectionally opening seals may be made to have high resistance in one direction, so that blown installation can take place only from one direction, thus preventing unauthorised installation from the other direction. This may be particularly useful for maintaining integrity within a building, with it being possible to blow packages outwardly from the building, but preventing access or even high pressure fluid flow along the ducts from outside the building.

Seal of the type described may be provided at intervals along a route to prevent low pressure leakage of contaminants along the duct. Another application is to provide such a seal in a lead-through gland between two airtight chambers, for example in the watertight bulkhead of a sea-going vessel.

Claims

1. A gas seal arrangement for use in a blown-fiber duct (11) which extends outside a building from within a building, the gas seal arrangement being inserted in a segment of said duct to prevent the flow of gas into the building via said duct (11) and being unidirectionally flexible, the arrangement comprising a connector (15) sealingly connected to respective blown-fiber duct portions on each side thereof, along which the transmission fiber (P) is to be disposed, the connector further comprising a flange portion (12a) and a flexible body portion (12b), the flexible body portion being arranged to collapse inwardly around a transmission fiber (P) when the transmission fiber has been installed through said duct segment , the flexible body portion being arranged to open to permit gas flow outwardly from the building through said duct segment when the gas flow pressure exceeds a predetermined level, i.e. during the time when the fiber is blown into the duct, and wherein the flexible body portion extends along said duct segment when at rest and is arranged to form an elongate seal with the surface of an installed transmission fiber (P) resistant to opening to gas flowing inwardly.

2. A gas seal arrangement as claimed in claim 1, wherein the body portion (12b) at rest is tubular with a bore diameter substantially equal to, or less than, the minimum diameter of the transmission fiber that is to be installed along the duct (11).

3. A gas seal arrangement as claimed in claim 2, wherein the bore of the tubular body portion (12b) is conical or tapering, with the wider end connected to the flange portion (12a).

4. A gas seal arrangement as claimed in claim 2, wherein the tubular body portion comprises a flat body portion consisting essentially of upper and lower lip portions that press against each other in the undisturbed state.

5. A blown-fiber installation comprising a duct (11) within which is received an optical fiber (P) which has been installed within said duct by means of a fiber blowing process, characterised in that the installation further comprises at least one sealing arrangement as claimed in any one of the preceding claims, the sealing arrangement providing a gas-seal to said optical fiber and being inserted in a segment of said duct (11).

Fig.1

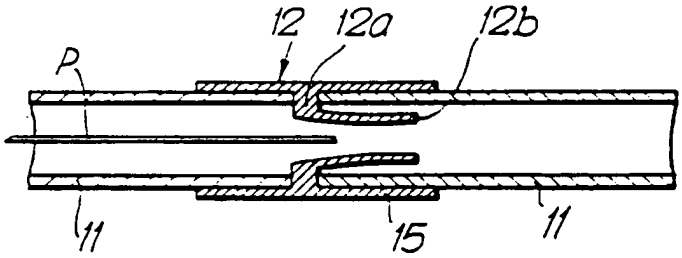

Fig.2.